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A New Subspecies of *Hemileuca maia* from Central Texas (Attacidae, Hemileucinae)

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The following paper describes a central Texas population of *Hemileuca maia* (Drury) which, although long represented in collections by a substantial number of specimens, has never been distinguished from the nominate subspecies. The characteristics of these Texas populations have become evident to me by abundant material collected in recent years by Roy O. Kendall and Richard S. Peigler.

Hemileuca maia peigleri **new subspecies**

Types

Holotype ♂ (Fig. 1): Texas, Bexar County, San Antonio, Ebony Hill Research Station, 24-XI-1978, netted 1240 hrs Central Standard Time, R. S. Peigler.

Allotype ♀ (Fig. 2): Texas, Bexar County, northern San Antonio near Helotes, *ex larva* on *Quercus fusiformis*, 16-XI-1963, R. W. & E. S. Quillen (*ex* collection of R. O. Kendall).

Paratypes: Collection of R. S. Peigler: 3 ♂, Brown Co., Lake Brownwood State Park, *ex larva* on *Q. fusiformis*, 13-20-X-1978, collected under Texas Parks Permit no. 20-78; 5 ♂, 1 ♀, Mills Co., ca. 8 km east of Goldthwaite, *ex larva* on *Q. fusiformis, Q. texana,* and *Q. havardii*, 2-27-XI-1978; 2 ♂, Bexar Co., San Antonio, Ebony Hill Research Station, netted 24-XI-1978. Collection of R. O. and C. A. Kendall: 7 ♂, 5 ♀, Brown Co., Lake Brownwood State Park, *ex larva* on *Q. fusiformis*, 29-X-6-XI-1978; 5 ♂, 4 ♀, Mills Co., *ex larva* on *Q. fusiformis*, 15-24-XI-1975; 8 ♂, 4 ♀, Bexar Co., San Antonio, 422 W. King Highway, *ex larva* on *Q. shumardii*, XI-1964, R. W. & E. S. Quillen; 9 ♂, 3 ♀, Bexar Co., north of San Antonio, Helotes, *ex larva* on *Q. fusiforma*, 12-16-XI-1963, R. W. & E. S. Quillen; 1 ♂, 2 ♀, Bexar Co., north of San Antonio, Bacon Road, *ex larva* on *Q. fusiformis*, 14 and 21-XI-1956; 1 ♀, Bexar Co., north of San Antonio, 19-XI-1961; 2 ♂, Bexar Co., San Antonio, Ebony Hill Res. Sta., 1 and 2-XII-1978. Collection of Texas A&M University: 1 ♂, Lampasas Co., Lampasas, 18-XI-1939; 2 ♂, Menard Co., 20-XI-1972, J. W. Stewart; 1 ♀, Sutton Co., Sonora, 25-IV-[larva?]-1932, S. E. Jones; 1 ♂, Kerr Co., Kerrville, 16-XI-1965,

Hoffmann; 14 ♂, Bandera Co., Bandera, 20-22-XI-1938, C. E. Heard; 1 ♂, north Bexar Co., 4-XII-1934. Collection of National Museum of Natural History: 3 ♂, Sutton Co., Sonora, on oak leaves (Bish. #14198); 1 ♀, same locality, emerged 16-XI-1935, coll. Babcock. Collection of American Museum of Natural History: 1 ♂, Gillespie Co., Fredericksburg, coll. F. H. Rindge; 2 ♂, Texas (Purchase C. L. Pollard); 1 ♂, Texas, G. D. Hulst. Collection of Los Angeles County Museum of Natural History: 1 ♂, Kerr Co., Kerrville State Park, 8-XI-1964; 5 ♂, 1 ♀, Bexar Co., San Antonio, 17-XI-1963, R. O. Kendall. The holotype and allotype have been deposited in the American Museum of Natural History. Some of the paratypes of the collections of Kendall and Peigler were also deposited in the Museum national d'Histoire naturelle (Paris).

Imago (Fig. 1 ♂, 2 ♀)

Expanse of male: 45-57 mm (length of forewing: 24-31 mm), expanse of female: 54-67 mm (length of forewing: 27-32 mm).

The subspecies differs from the nominate subspecies (Fig. 3 ♂, 4 ♀) by the semi-transparentness of the four wings, giving a glossy and varnished appearance, especially in male specimens.

The covering of scales, of which the feeble density can clearly be seen by examination with the scanning electron microscope (Figs. 5, 6) is of great fragility. The scale cover tends to disappear in specimens which have flown (Fig. 8). Flown specimens become almost entirely transparent, unlike *H. m. maia* in which the wings of worn individuals conserve, at least in some regions of the wing, a certain opaqueness. Observations under high magnification show that, at the time of shedding, the scales are not pulled out but merely are broken, a little portion remaining above the base. The mechanism is the same in both subspecies but the effects are much more striking in *H. m. peigleri*.

The variation of the ornamentation, and more particularly the size of the white median band of the four wings, is the same as in *H. m. maia*; as in them and *H. lucina* Henry Edwards the white bands of the forewings tend to be wider on the ventral surface than on the dorsal surface.[1]

Early Stages

Larva: Comparison of the larva of the sixth instar[2] of *H. m. maia* and *H. m. peigleri*, according to material originating respectively from

[1]This character is pointed out by Ferguson (1971: 115, 122).

[2]In principle, the final stage. But since in the early instars the larvae all molt simultaneously, regardless of their size, some of them may be very late in growth when most of the others are full grown, so that they need one or even two supplementary molts to reach pupation; the duration of the larval stage can thus be prolonged by several weeks.

Baton Rouge (campus of Louisiana State University), Louisiana, and Mills Co., Texas (8 km east of Goldthwaite), gave differences as shown in Table 1.

TABLE 1

Differences between mature larvae of the two subspecies of *Hemileuca maia*

Characteristic	*H. maia maia*	*H. maia peigleri*
Subdorsal tubercles of metathoracic segment and abdominal segments 1 to 7; dorsal tubercle on abdominal segment 8	White branches	Yellow branches
Other tubercles	Principal spine red, long	Principal spine blackish, clearly shorter
Mottling on epidermis	Light gray	Ivory
Subspiracular line	Vague	Contrasting
Head capsule, thoracic legs and anal plate	Garnet red	Orangish

Pupa: The rim situated on the anterior edge of each of abdominal segments 5 to 7 is at least twice as wide in *H. m. peigleri* (Fig. 9) than in *H. m. maia* (Fig. 10); the zone of abdominal segment 8 in *H. m. peigleri* has much more accentuated teeth and the ventral face of this segment is more rugose.

Ethology

The behavior in the different phases of the preimaginal and imaginal life appears identical in both subspecies. The following notes were extracted from the personal notes of R. O. Kendall and R. S. Peigler.

Hibernation is in the egg stage. Eggs are deposited on a twig of the host plant such that they form a ring composed of numerous eggs. The main host is *Quercus fusiformis* Small; the larvae are also found on other species of oak such as *Q. shumardii* Buckley, *Q. texana* Buckley, and *Q. havardii* Rydb. In nature the larvae hatch in February/March and continue their development until May/June. They are gregarious until the fourth stage, and are frequently parasitized, notably by:

Diptera: Tachinidae

Spoggosia floridensis (Townsend) (det. C. W. Sabrosky)

Belvosia bifasciata (Fabricius) (det. C. W. Sabrosky)

Hymenoptera: Ichneumonidae

Enicospilus texanus (Ashmead) (det. R. W. Carlson)

Pupation occurs in the soil, among dead foilage or slightly below the surface, the pupa enveloped by a mesh of very loose silk. The diapause is in summer but some persist with a hibernation, emerging in the autumn of the following year.

The adult flies during the entire month of November, especially the second fortnight, and into early December. The emergence takes place generally in the morning; in captivity the insect searches feverishly for a horizontal support on which to expand its wings, requiring a long period (30-45 minutes) for expansion after emergence; I have noticed the same for *H. m. maia*, unusual for Attacidae. Flight is diurnal, especially during sunny times (but Peigler has also observed the time covered), of approximately 930 hrs to 1500 hrs. The moths often fly high and rapidly, so that generally many more are seen than can be netted.

Geographical Distribution

Hemileuca maia peigleri is only known at present from the following counties of central Texas: Brown, Mills, Lampasas, Menard, Sutton, Kimble, Gillespie, Blanco, Kerr, and Bexar (Fig. 11). It is probably endemic to the Edwards Plateau, consisting of calcareous hills with *Q. fusiformis*. A female in the Kendall collection from southern Oklahoma (Logan County) was sent to me with the type material; the

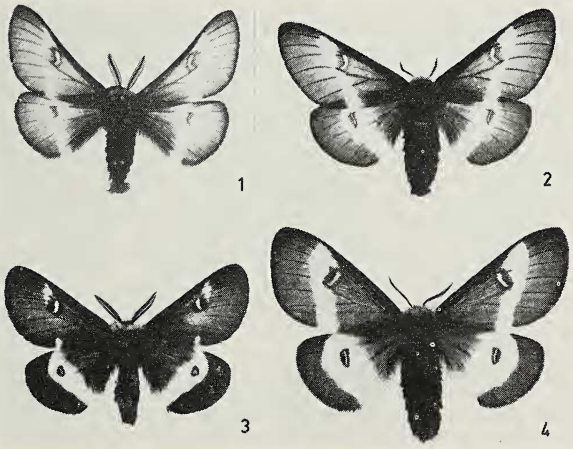


Fig. 1. *Hemileuca maia peigleri*, holotype ♂, Texas, Bexar County, San Antonio, Ebony Hill Res. Sta.

Fig. 2. *H. maia peigleri*, allotype ♀, Bexar County, northern San Antonio near Helotes.

Fig. 3. *H. maia maia* ♂, Louisiana, Baton Rouge, campus of Louisiana State University.

Fig. 4. *H. maia maia* ♀, same locality.

determination of this single specimen requires confirmation. A male labeled "Texas" (without further locality data) from the National Museum of Natural History, is a typical *H. m. maia*; the occurrence in eastern Texas of the nominate subspecies, very abundant in Louisiana at certain places (e.g., Baton Rouge), would not be surprising.

Because of the semi-hyaline aspect of the wings, in combination with the wideness of the white bands, *H. m. peigleri* has been misdetermined as *H. nevadensis* Stretch in some collections. The latter species possible extends as far east as western Texas, but certainly not central Texas where *H. m. peigleri* occurs, where Kendall and Peigler have intensively collected.

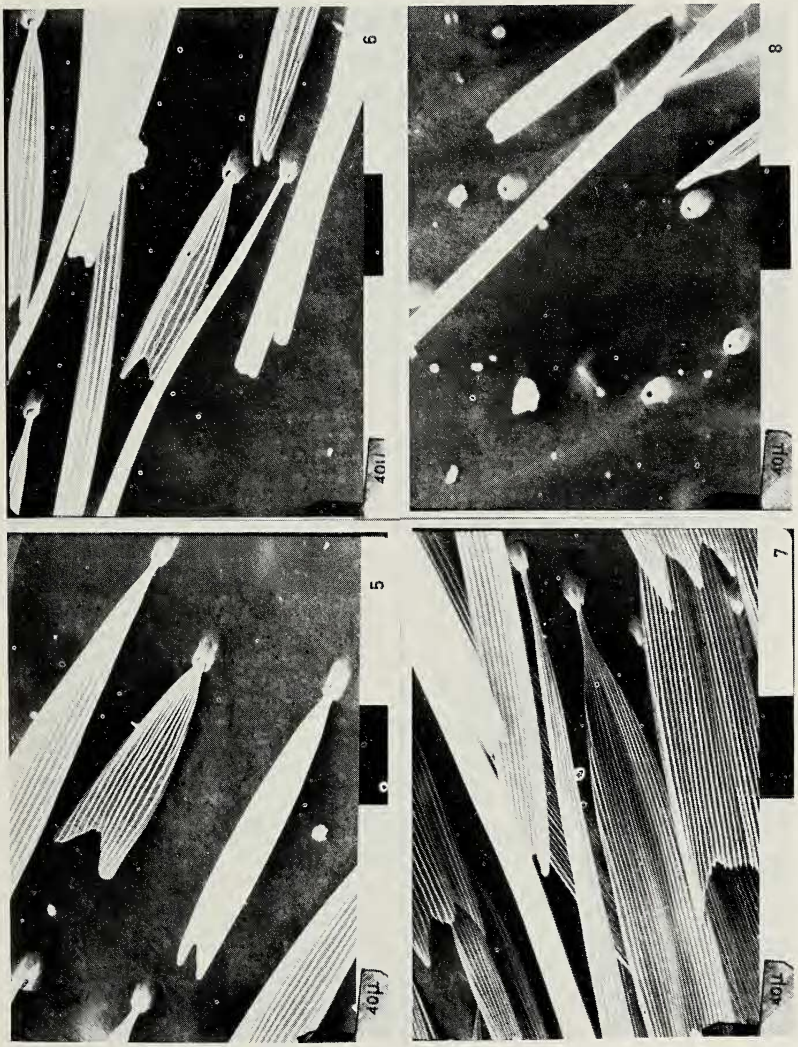
Discussion

Hemileuca maia, H. nevadensis, and *H. lucina* form a very homogeneous group of three phenotypically close species, but having three different host plants, respectively *Quercus*,[3] *Salix,* and *Spiraea.* Although *H. m. peigleri* has a host of oak like *maia* and it is phenotypically closest to this species of the genus, it is natural to ask, because of its geographic isolation in a very particular biotope and with constant differences in the preimaginal stages, if it is a distinct species.

The geographic isolation does not accompany an obligatory modification of the genetic constitution and I cite in a recent work (LeMaire, 1978: 16) the example of a very disjunct range of *Paradaemonia ruschii* May & Oiticica of which the only two known localities are about 5000 km apart. The development or maintenance of isolated populations is always common in Attacidae, which are known to adapt to very diverse environments. Species such as *Arsenura armida* (Cramer), *Eacles imperialis* (Drury), and *Titaea tamerlan* (Maassen), live in tropical rainforests as well as semi-arid zones. Quite often the modification of the ecological conditions is not very conducive to subspeciation and it would therefore be hazardous in the case of *peigler*, considering the extensive range of *maia*, to arrive at the conclusion of the species level.

The differences regarding the external morphology of the larva and pupa should also be interpreted with care. Ferguson (1971: 117) reported notable geographic variation in the larva of *H. maia*; in the figure in Packard (1914: pl. 22) the larva does not exactly resemble those from Baton Rouge which I have compared to *peigleri.* It is possible that the modification of the pupa is attributable to an ecological factor, such as the nature of the soil; the enlargement of the

[3]According to Ferguson (1971: 116), it is possible that an Illinois population, reported as *H. maia*, lives on willow.



Figs. 5-8. Wing scales of *Hemileuca maia* viewed with scanning electron microscope (500x).

5-6. *H. maia peigleri* ♂, *ex-larva*, Mills County.

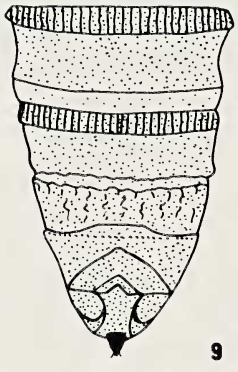
7. *H. maia maia* ♂, *ab ovo*, Baton Rouge.

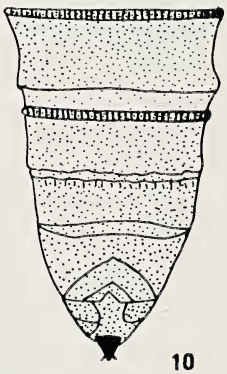
8. *H. maia peigleri* ♂, Bandera County (wild collected).

rim on the anterior edge of abdominal segments 5 to 7 also occurs in *H. grotei* Grote & Robinson which shares the same biotope.

The similarity in structure of the genital armature cannot be used as an argument in favor of conspecificity of *peigleri* and *maia*, because I fail to find constant differences between the genital armature of these and that of *H. nevadensis* and *H. lucina*,[4] which are certainly distinct species.

The most plausible hypothesis is that *peigleri* is a subspecies of *maia*. I consider as a most important feature that the variation of the ornamentation will be found to be identical in the two taxa, since this type of character seems to be especially significant in the group concerned, i.e., the three species of *Hemileuca*. The status adopted should be rather easily confirmed or reputed by hybridization experiments, considering the ease with which such crosses may be obtained.





Figs. 9-10. Pupae of *Hemileuca maia*, schematic view of the last abdominal segments, ventral view.
9. *H. maia peigleri* ♂.
10. *H. maia maia* ♂.

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[4]In specimens which I have examined, I have not been able to verify the differences which distinguish the genital armature of *H. lucina* according to Ferguson (1971: 122).

extreme use in comparing with that of Kendall and Peigler. The scanning electron microscope photographs were produced at the Laboratoire d'Entomologie generale et appliquee of the Museum national d'Histoire naturelle (Paris) by Mr. Jacques Boudinot.

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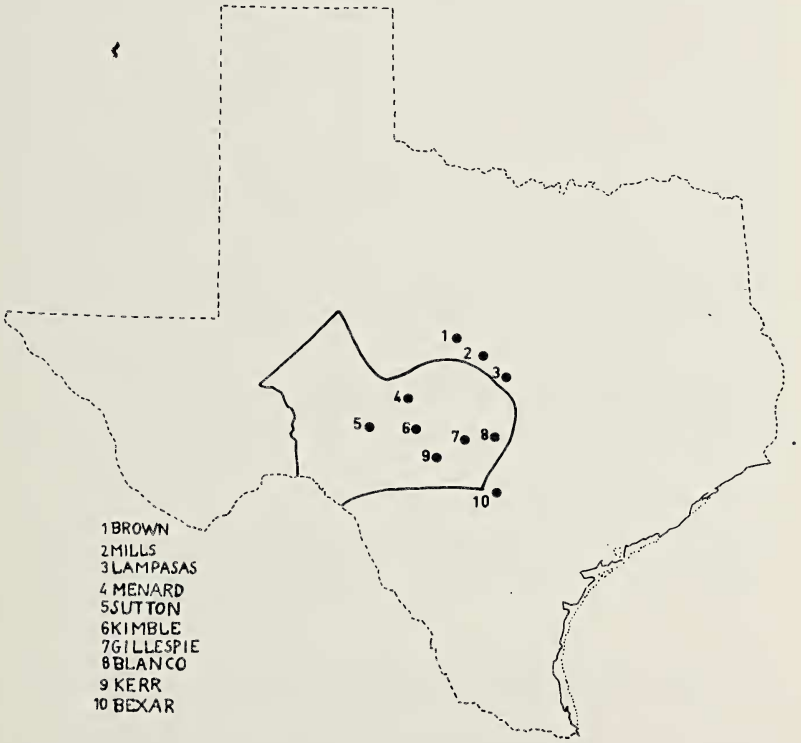

Fig. 11. Map showing known distribution of *H. maia peigleri* with a list of Texan counties for which it is recorded. The unbroken line indicates the boundaries of the Edwards Plateau.